A structurally simplified and economical embodiment of the control lever is made possible in that the retractable arm is made from a bent leaf spring and is slidably supported in a guiding slot of an arm portion of U-shaped cross section.

Furthermore, in accordance with the invention the control lever is provided with a plurality of bores opposite which corresponding bores are disposed in a support member connected with the housing of the sewing machine, where a pin inserted in opposite bores constitutes a link joint between the support member and the control lever. In this manner it is possible by simple change of the position of the pin to produce differently stepped button hole sizes.

A further object of the invention and details of the advantages provided thereby will become apparent from the following description of an embodiment illustrated in the accompanying drawings, in which:

FIG. 1 is a front view of the sewing machine provided with the new arrangement for the automatic sewing of the button holes.

FIG. 2 is a partial view of the machine taken from the top with the cover removed.

FIG. 3 is a perspective exploded partial view of the machine with the head cover removed and illustrating the removed arm cover as well as the support plate from the bottom and

FIG. 4 is a section taken along the line IV—IV in FIG. 3.

On the arm 1 of the sewing machine a support plate 4 (FIG. 2) is mounted below the cover 2 which supports a lid 5. A shaft 5 is rotatably journaled on the support plate 4, and a control cam 7 having a cam groove 6 is secured to said shaft 5. Furthermore, two integrable control cams 8 and 9 which are rigidly connected with one another are journaled on the shaft 5. They are held in place by a nut 10. A pin 11, which is secured to the cam disks 8 and 9 and extends parallel to the axis of the shaft 5, engages a corresponding bore in the cam disk 7 below it and insures of the cam disks 8 and 9 being moved along by the shaft 5.

The shaft 5 is driven by a continuously adjustable step-by-step mechanism 12 (FIG. 3) which is drivenly connected by way of a thrust bar 13 and a double armed lever 14 to a conical cam 16 secured to the arm shaft 15 of the machine. The double armed lever 14 is biased by a helical spring 17 which at one end is secured to the lever 14 and at the other end to the support plate, in a manner that a roller 18 provided at the free end of the lever 14 is held in constant engagement with the cam 16.

The lever 14 is rotatably mounted at its hub 19 on a pivot shaft 20 which is secured to a slide member 21 which is moveable parallel to the arm shaft 15. The slide member 21 is secured to and guided on the support plate 4 by means of collar screws 22 which extend through longitudinal slots 23.

The slide member 21 has a recess 24 into which enters a pin 26 mounted on a crank arm 25. The crank arm 25 is rotatably mounted by means of shaft 27 in the cover 2, which shaft extends through the cover and has a switching knob 28 (FIG. 1) at the upper outwardly extending free end. The support plate 4 is provided with a longitudinal aperture 29 (FIG. 3) of sufficient length to enable the pin 26 to reach through unimpededly for operating the slide member 21.

A lever 30 (FIG. 2) which is rotatably journaled about a bolt 31 secured to the support plate 4 is provided with a projecting lug 32 which engages the control cam or disk 8. The lever 30 is linked at its free end with a force link bar 33 which is connected by means of an eccentric collar screw 34 to a lever arm 35 (FIG. 3) which cooperates in
a known manner with the mechanism for the stitch width control. A known manner with the mechanism for the stitch width control. An angular lever 37 is rotatably journaled upon a further bolt 36 (FIG. 2) secured to the support plate 4 and is provided at one end with a cam follower 38 and connected at the other end with a linkage bar 39. The linkage bar 39 in turn is connected by means of an eccentric collar screw 40 to a lever arm 41 which cooperates in a known manner with the stitch centering mechanism.

Bolt 31 (FIG. 2) also pivotally supports a double armed lever 42, one arm 43 of which has a lug 44 which is guided in the cam groove 6 of the cam disk 7. The end 45 (FIG. 3) of the other arm of the double armed lever 42 is bent downwardly and supports a ball head 46. A U-shaped angle bracket 47 is secured to the head of the machine which has a bridge portion 48 to which a stirrup 49 is threadedly secured. The bridge portion and the stirrup together form a support bearing 50 for a control lever 51 which at its upper end is provided with an eyelet 52 which encompasses the ball head 46.

The center part of the stirrup 49 and also the bridge 48 are provided with strips 53 and 54 which extend longitudinally of the control lever 51 to provide better guidance for the control lever 51. On the outside of the center portion of the stirrup 49 a vertically extending reinforcement member 55 is provided which engages a slot (not illustrated) in the head cover 56 (FIG. 1) of the machine.

The support member 59 (FIG. 4) is provided with a plurality of bores 57 which register with corresponding bores 58 in the control lever 51. A pin 59 having a manipulating knob which can be inserted as desired into registering bores 57, 58 constitutes the pivot point for the control lever 51. The control lever 51 has an arm portion 60 (FIG. 3) the longitudinal edges of which are turned up in U-shaped fashion to form the slide for a resilient arm 62 extending in the direction of the material presser bar 61 of the machine and which is provided with a longitudinal slot 63 for sliding in the arm portion 60 while it is bent over at the lower end to form a grip 64.

A presser foot 65 which is secured to the presser bar of the sewing machine comprises a shank 66, a sole 67, a joint or pivot pin 68 and a roller 69. The shank 66 has two lateral lugs 70 supporting the pin 68 on which the roller 69 is journaled. The outwardly extending ends of the pin 68 project into elongated slots 71 on the turned up leg portions 72 of the U-shaped sole portion 67 while the roller 69 rests on the inner surface of the sole and imparts pressure to the sole by means of a presser foot spring (not illustrated).

One of the two side or leg portions 72 of the sole 67 is provided with a pin 73 onto which the arm 62 of the control or guide lever 51 may be hooked by means of a vertical slot 74 provided above the grip member 64, after being slidingly withdrawn from the arm portion 60.

The device operates as follows:

During operation of the machine oscillating movements are imparted to the double armed lever 14 by way of the cam 16 and roller 18 which are transmitted to the step-by-step mechanism 12 by means of pusher bar 13. As a result the control cams 7, 8 and 9 are driven or moved in steps. If the switch knob 28 is operated, the pivot shaft 29 of the double armed lever 14 is moved parallel to the arm shaft 15. The roller 18 is thus guided along the side of the substantially conical cam 16. As a result the magnitude of the feeding movements of the control disks 7, 8 and 9 can be varied continuously from zero to a maximum eccentricity of the cam 16.

In order to produce a button hole the knob 28 is set for a small angle of rotation per step of the shaft 5. Arm 62 of the control lever 51 is pulled out and the sole 67 of the presser foot 65 slidingly moved until the pin 73 provided on the side of the leg portion 72 of sole 67 can be entered into the slot 74 of the arm 62. The machine is now set for button hole sewing.

The button hole seam can be started at any desired por-
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5 needle bar is slidingly supported, a presser bar disposed in said machine head substantially parallel to said needle bar and a presser foot secured to the lower end of said presser bar, said presser foot having a sole member mounted thereon for sliding movement transversely of said presser bar and having a connecting device, means for moving said sole member including a control lever having a portion detachably supporting said sole member, a step-by-step mechanism mounted proximate said machine head, a cam member on said drive shaft, means including a cam follower operatively linking said step-by-step mechanism to said cam member and means operatively connecting said control lever to said step-by-step mechanism, said control lever being a double armed lever having one arm portion provided at its lower end with connecting means for engagement with said connecting device and having a retractable portion in sliding engagement with the other arm portion of said lever for telescoping movement relative thereto, said one arm portion being defined by a leaf spring and the other said arm portion being of U-shaped cross section defining a sliding channel.

4. Device for automatically sewing button holes on zig-zag sewing machines of the type having a machine head, a drive shaft, a needle bar disposed in said machine head operatively connected to said drive shaft, a needle bar oscillator disposed in said machine head in which said needle bar is slidingly supported, a presser bar disposed in said machine head substantially parallel to said needle bar and a presser foot secured to the lower end of said presser bar, said presser foot having a sole member mounted thereon for sliding movement transversely of said presser bar and having a connecting device, means for moving said sole member including a control lever having a portion detachably supporting said sole member, a step-by-step mechanism mounted proximate said machine head, a cam member on said drive shaft, means including a cam follower operatively linking said step-by-step mechanism to said cam member and means operatively connecting said control lever to said step-by-step mechanism, said control lever having a plurality of bores, said device further including a pivot member mounted on said machine head and having a plurality of bores, and a pin engageable with different pairs of corresponding bores to provide a pivot support for said lever.

5. Device for automatically sewing button holes on zig-zag sewing machines of the type having a machine head, a drive shaft, a needle bar disposed in said machine head operatively connected to said drive shaft, a needle bar oscillator disposed in said machine head in which said needle bar is slidingly supported, a presser bar disposed in said machine head substantially parallel to said needle bar and a presser foot secured to the lower end of said presser bar, said presser foot having a sole member mounted thereon for sliding movement transversely of said presser bar and having a connecting device, means for moving said sole member including a control lever having a portion detachably supporting said sole member, a step-by-step mechanism mounted proximate said machine head, a cam member on said drive shaft, means including a cam follower operatively linking said step-by-step mechanism to said cam member and means operatively connecting said control lever to said step-by-step mechanism, said control lever being a double armed lever having one arm portion provided at its lower end with connecting means for engagement with said connecting device and having a retractable portion in sliding engagement with the other arm portion of said lever for telescoping movement relative thereto, said one arm portion being defined by a leaf spring and the other said arm portion being of U-shaped cross section defining a sliding channel, said control lever having a plurality of bores, said device further including a pivot member mounted on said machine head and having a plurality of bores, and a pin engageable with different pairs of corresponding bores to provide a pivot support for said lever.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Emerich Schenkengel

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 6, line 8, after "control" insert -- lever --.

Signed and sealed this 9th day of June 1964.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents